DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]Especially this invention relates to an image processing device which performs high efficiency coding of a picture signal, and decoding, and a method for the same about an image processing device and a method for the same.
[0002]
[Description of the Prior Art]It is possible to carry out high efficiency coding of a lot of digital information, such as video, a still picture, and a sound, and to perform record to a small magnetic recording medium and transmission to communication media by progress of digital signal processing technology, in recent years. Such art is applied and examination of multimedia apparatus which is intermingled and can treat an animation, a still picture, and several images from which resolution differs further is performed.
[0003]Drawing 4 is a block diagram which can code both a low resolution image and a high resolution image and in which showing the composition of conventional highly efficient coding equipment. In drawing 4, 401 a video signal input terminal and 402 a switch part and 403 A low resolution video encoding part, 404 -- as for a high pass type filter and 408, a low-passed type filter and 406 are [a high region coding part and 410] high region numerals output terminals a down sampler and 409 a down sampler and 407 a low resolution image numerals output terminal and 405.
[0004]Hereafter, the coding processing in this device is explained. Either one of a low resolution video signal or the high resolution video signal which has the resolution of twice [be / horizontal/vertical] is inputted into the video signal input terminal 401, and the switch part 402 and the low-passed type filter 403, and the high pass type filter 407 are supplied.
[0005]After the high resolution video signal inputted is divided into a low-pass signal and a high band signal by the low-passed type filter 405 and the high pass type filter 407, it is supplied to the down sampler 406,408, respectively. Here shows the example of frequency division with the low-passed type filter 405 and the high pass type filter 407 to drawing 6. Two-dimensional frequency domain LL [in / in the low-passed type filter 405 / drawing 6], i.e., the level/perpendicular, passes only the low zone of the half of a high resolution video signal. One high pass type filter 407 passes only LH of drawing 6, HL, and HH field.
[0006]The low-pass signal supplied from the low-passed type filter 405 is thinned out in a half as it is also horizontal/vertical, and it is changed into the video signal of the same pixel number as a low resolution image, and the down sampler 406 supplies it to the switch part 402. The switch part 402 chooses from the video signal input terminal 401 the video signal by which direct supply is carried out, and the video signal supplied from the down sampler 406, and supplies either to the low resolution video encoding part 404. That is, when the input signal to the video signal input terminal 401 is a high resolution video signal, the video signal supplied from the down sampler 406 is chosen, and when this input signal is a low resolution video signal, the video signal supplied from the video signal input terminal 401 is chosen.
[0007]To the signal supplied from the switch part 402, by performing each processing of orthogonal transformation, quantization variable length coding, etc., the low resolution video encoding part 403 is changed into low resolution image numerals, and is outputted to the low resolution image numerals output terminal 404.
[0008]That it is horizontal/vertical in the high band signal supplied from the high pass type filter 407 supplies the down sampler 408 to infanticide and the high region coding part 409. By performing each processing of quantization variable length coding etc. to the signal supplied, the high region coding part 409 is changed into high region numerals, and is outputted to the high region numerals output terminal 410.
[0009]Drawing 5 is a block diagram which decodes the signal coded by the conventional highly efficient coding equipment shown in drawing 4 and in which showing the conventional highly efficient decoding device composition. In drawing 5, a low resolution image code input terminal and 502 501 A low resolution image

decoding part, 503 -- a switch part and 504 -- as for a low-passed type filter and 509, a high region code input terminal, a 506 quantity region decoding part, and 507 are [a high pass type filter and 511] adder units a rise sampler and 510 a rise sampler and 508 video signal output terminals and 505.
[0010]The image numerals supplied to the low resolution image code input terminal 501 are supplied to the low resolution image decoding part 502. When a high resolution image is processed on the occasion of coding, these image numerals are equivalent to frequency band LL shown in drawing 6. By performing variable-length decoding inverse quantization and inverse orthogonal transformation to the image numerals supplied, the low resolution image decoding part 502 decodes a video signal, and supplies it to the switch part 503 and the rise sampler 507.
[0011]The high region numerals supplied to the high region code input terminal 505 are supplied to the high region decoding part 506. These high region numerals are equivalent to the frequency bands LH, HL, and HH which are obtained when a high resolution image is coded and which are shown in drawing 6. The high region decoding section 506 carries out variable-length decoding inverse quantization of these high region numerals, and supplies them to the rise sampler 509.
[0012]The rise sampler 507,509 inserts 0 horizontally/vertically to the signal sequence supplied, and supplies it to the low-passed type filter 508 and the high pass type filter 510, respectively. The low-pass **** type filter 508 passes only the zone LL equivalent portion in the signal sequence supplied from the rise sampler 507, and is supplied to the adder unit 511. On the other hand, the high pass type filter 510 passes only the zones LH and HL and HH equivalent portion in the signal sequence supplied from the rise sampler 509, and is supplied to the adder unit 511.
[0013]By adding a zone LL equivalent portion, and the zones LH and HL and HH equivalent portion, the adder unit 511 reconstructs all the zones of a high resolution image, and supplies them to the switch part 503. When the numerals supplied to a decoding device are the numerals to a low resolution image, the switch part 503, The signal supplied from the low resolution image decoding part 502 is chosen, and when the numerals supplied are the numerals to a high resolution image, the signal supplied from the adder unit 511 is chosen, and it outputs to the video signal output terminals 504.
[0014]As mentioned above, in the conventional high efficiency coding/decoding device, In order to perform coding/decryption of the low-pass portion of a high resolution image, high compatibility with the coding/decoding device only treating the conventional low resolution image is realized by using the low resolution image coding / decoding part (403,502) which processes only a low resolution image. That is, if only low resolution image numerals are supplied to the conventional decoding device, it is possible to reproduce the low-pass portion of a high resolution image.
[0015]
[Problem(s) to be Solved by the Invention]However, in the above-mentioned conventional high efficiency coding/decoding device, If its attention is paid to the imaging quality in coding/decoding of a high resolution image while realizing high compatibility with the coding/decoding device only treating the conventional low resolution image, Degradation in low resolution image coding / decoding part (403,502) had great influence on the coding/decoding as the whole high resolution image, and was not able to realize sufficient image quality.
[0016]It is in providing an image processing device which enables high-definition coding processing to high resolution images without spoiling compatibility with the device only on such a background and corresponding to a low resolution picture in the purpose of this invention, and a method for the same.
[0017]
[Means for Solving the Problem]An image processing device of this invention is provided with the following composition as a way stage for attaining the above-mentioned purpose.
[0018]Namely, an input means which inputs a high-resolution-images signal which has predetermined resolution, A low frequency wave extraction means to extract a low-frequency component signal from this high-resolution-images signal, The 1st high frequency extraction means that extracts the 1st high frequency component signal from this high-resolution-images signal, It has the 2nd high frequency extraction means that extracts the 2nd high frequency component signal from said low-frequency component signal, a low frequency wave encoding means which codes said low-frequency component signal, and a high frequency encoding means which codes said 1st high frequency component signal and said 2nd high frequency component signal.
[0019]Said input means inputs a low resolution picture signal which is a low resolution rather than said predetermined resolution, and said low frequency wave encoding means codes said low resolution picture signal.
[0020]A low frequency wave decoding means which a low-frequency component and a high frequency component of an image are an image processing device which decodes an encoded signal coded, respectively, and decodes an encoded signal of said low-frequency component, and creates the 1st low-frequency component signal, A low frequency wave extraction means to extract the 2nd low-frequency component signal from said 1st low-

frequency component signal, It has a synthesizing means which creates a high-resolution-images signal which compounds a high frequency decoding means which decodes an encoded signal of said high frequency component, and creates the 1st and 2nd high frequency component signals, and the said 2nd low-frequency component signal, said 1st, and 2nd high frequency component signals, and has predetermined resolution.
[0021]Said low frequency wave decoding means decodes an encoded signal of a low resolution picture signal which is a low resolution rather than predetermined resolution in a high-resolution-images signal created by said synthesizing means.
[0022]
[Embodiment of the Invention]Hereafter, one embodiment concerning this invention is described in detail with reference to drawings.
[0023]<1st embodiment> drawing 1 is a block diagram showing the composition of the highly efficient coding equipment in this embodiment. In drawing 1, 101 a video signal input terminal and 102 a switch part and 103 A low resolution video encoding part, 104 -- a low resolution image numerals output terminal and 105 -- a low-passed type filter and 106 -- as for a high region coding part and 110, a high pass type filter and 108 are [a high pass type filter and 112] down samplers a high region numerals output terminal and 111 a down sampler and 109 a down sampler and 107.
[0024]- coding **** of a low resolution image -- explain first the case where a low resolution image is inputted into the video input terminal 101. The low resolution video signal supplied to the video input terminal 101 is supplied to the low resolution video encoding part 103 via the switch part 102. By performing processing of orthogonal transformation and quantization variable length coding to this low resolving video signal, the low resolution video encoding part 103 is changed into low resolution image numerals, and is outputted to the low resolution image numerals output terminal 104.
[0025]- Explain the case where the still picture of high resolution is inputted into coding processing, then the video input terminal 101 of a high resolution image. The high resolution video signal supplied to the video input terminal 101 is supplied to the low-passed type filter 105 and the high pass type filter 111. With a low-passed type filter and a high pass type filter, a high resolution image is divided into a low-pass signal and a high band signal, and is supplied to the down sampler 106,112, respectively.
[0026]Here shows the example of frequency division with the low-passed type filter 105 and the high pass type filter 111 to drawing 3 (a). Two-dimensional frequency domain LL [in / in the low-passed type filter 105 / the figure], i.e., the level/perpendicular, passes only the low zone of the half of a high resolution video signal. One high pass type filter 111 passes only LH of the figure, HL, and HH field.
[0027]The down sampler 106 by thinning out in a half the low-pass signal supplied from the low-passed type filter 105 as it is also horizontal/vertical, After changing into the low resolution image of the same pixel number as the low resolution image which can be inputted in this embodiment, the switch part 102 and the high pass type filter 107 are supplied. The switch part 102 chooses the low resolution image supplied from said down sampler 106, and supplies it to the low resolution video encoding part 103.
[0028]the low resolution video encoding part 103 receives low resolution image numerals -- processing of orthogonal transformation, quantization, and variable length coding -- ****** -- by things, it changes into low resolution image numerals, and outputs to the low resolution image numerals output terminal 104.
[0029]The high pass type filter 107 supplies only the high-frequency component of the low resolution image supplied from the down sampler 106 to the down sampler 108. The example of the high-frequency component which the high pass type filter 107 passes is shown in drawing 3 (b) here. That is, only the field shown by LLLH, LLHL, and LLHH in the figure is supplied to the down sampler 108.
[0030]In each field, the down sampler 112 and the down sampler 108 thin out the supplied signal sequence in a half as it is also horizontal/vertical, and they supply it to the high region coding part 109. In the high region coding part 109, by performing each processing of quantization and variable length coding to the supplied signal, it changes into high region numerals and outputs to the high region numerals output terminal 110.
[0031]As explained above, when a high resolution video signal is inputted according to this embodiment, the low-frequency component (LL) and high frequency component (LH, HL, HH) are extracted, a high frequency component (LLLH, LLHL, LLHH) is further extracted from this low-frequency component (LL), and each is coded. Therefore, when coding a high resolution image, high definition-ization is realized rather than the case where a low-frequency component (LL) is coded as it is like the former.
[0032]Since general processing about coding of the low resolution image equivalent to a low-frequency component is performed, compatibility with the conventional device is maintainable.
[0033]Since there is comparatively little amount of information of the high frequency component (LLLH, LLHL, LLHH) extracted from a low-frequency component (LL) in this embodiment, size cannot tear encoding efficiency.

[0034]Below <a 2nd embodiment> describes a 2nd embodiment concerning this invention. In a 2nd embodiment, the highly efficient decoding device corresponding to the highly efficient coding equipment shown in a 1st embodiment mentioned above is explained.
[0035]Drawing 2 is a block diagram showing the composition of the highly efficient decoding device in a 2nd embodiment. In drawing 2, a low resolution image code input terminal and 202 201 A low resolution image decoding part, 203 a switch part and 204 video signal output terminals and 205 A high region code input terminal, a 206 quantity region decoding part and 207 -- a rise sampler and 208 -- a low-passed type filter and 209 -- as for a high pass type filter and 213, a rise sampler and 211 are [a high pass type filter and 215] adder units a rise sampler and 214 a low-passed type filter and 212 an adder unit and 210.
[0036]- decoding **** of a low resolving image -- explain the case where the numerals of a low resolution image first coded by the highly efficient coding equipment of a 1st embodiment mentioned above are supplied. The low resolution image numerals supplied to the low resolving image code input terminal 201 are supplied to the low resolution image decoding part 202, and after being changed into image numerals by performing each processing of variable-length decoding, inverse quantization, and inverse orthogonal transformation, they are supplied to the switch part 203.
[0037]And in the switch part 203, the video signal supplied from the low resolution image decoding part 202 is outputted to the video signal output terminals 204.
[0038]- Explain the case where the numerals of the high resolution image coded by the decoding processing of a high resolution image, then the highly efficient coding equipment of a 1st embodiment are supplied.
[0039]In this case, the image numerals equivalent to frequency band LL shown in drawing 3 (a) are first supplied to the low resolution image code input terminal 201. In the low resolution image decoding part 202, a low resolution image is decoded by performing variable-length decoding, inverse quantization, and inverse orthogonal transformation to the supplied image numerals, and the low-passed type filter 208 is supplied. The low-passed type filter 208 supplies an equivalent for the frequency band LLLL shown in the low-pass signal of the supplied low resolution image, i.e., drawing 3, (b) to the adder unit 209.
[0040]On the other hand, the high region numerals supplied to the high region code input terminal 205 are supplied to the high region decoding part 206. The high region numerals inputted here are equivalent to the frequency bands LLLH and LLHL shown in the frequency bands LH, HL, and HH shown in drawing 3 at the time of coding a high resolution image (a), and drawing 3 (b), and a LLHH field. The high region decoding section 206 performs variable-length decryption and inverse quantization to these high region numerals, and supplies the signal sequence which is equivalent to the rise sampler 213 in the signal sequence equivalent to the frequency bands LH, HL, and HH in the frequency bands LLLH, LLHL, and LLHH to the rise sampler 207, respectively.
[0041]The rise sampler 207,213 inserts "0" values horizontally/vertically to the signal sequence supplied, and supplies them to the high pass type filter 212,214, respectively. The high pass type filter 212 passes the frequency bands LLLH, LLHL, and LLHH shown in drawing 3 (b) in the signal sequence supplied, and is supplied to the adder unit 209. In the adder unit 209, the supplied zones LLLH, LLHL, and LLHH and the zone LLLL supplied from the low-passed type filter 208 are added, zone LL shown in drawing 3 (a) is reconstructed, and the rise sampler 210 is supplied.
[0042]The rise sampler 210 inserts "0" values horizontally/vertically to the supplied signal sequence, and supplies them to the low-passed type filter 211. The low-passed type filter 211 passes only zone LL shown in drawing 3 (a) in the signal sequence supplied from the rise sampler 210, and is supplied to the adder unit 215. On the other hand, the high pass type filter 214 passes the zones LH, HL, and HH shown in drawing 3 (a) in the signal sequence supplied from the rise sampler 213, and is supplied to the adder unit 215. The adder unit 215 adds zone LL and the zones LH, HL, and HH which are supplied, reconstructs all the zones of a high resolution image, and supplies them to the switch part 203.
[0043]And in the switch part 203, the signal supplied from the adder unit 215 is chosen, and it outputs to the video signal output terminals 204.
[0044]The video signal by which high efficiency coding was carried out with the highly efficient coding equipment shown in a 1st embodiment mentioned above can be decoded appropriately, maintaining compatibility with the conventional decoding device according to a 2nd embodiment, as explained above.
[0045]In a 2nd embodiment, when decoding a high resolution image, all the zones of the high resolution image were reconstructed, and by adding zone LL and the zones LH, HL, and HH in the adder unit 215 explained the example outputted to the switch part 203. This is not added here, but if it constitutes so that only zone LL may be outputted to the switch part 203, a high definition low resolution image can be outputted.
[0046]In 1st and 2nd embodiments mentioned above, although the example which separates, outputs and inputs low resolution image numerals and high region numerals was explained, it is good also as composition which

outputs and inputs the signal which multiplexed these. The method of carrying out time multiplexing of for example, low resolution image numerals and the high region numerals as a multiplexing method in this case, the method of frequency-multiplexing-izing, etc. are applicable.
[0047]
[Other embodiments] Even if it applies this invention to the system which comprises two or more apparatus (for example, a host computer, an interface device, a reader, a printer, etc.), it may be applied to the devices (for example, a copying machine, a facsimile machine, etc.) which consist of one apparatus.
[0048]The purpose of this invention the storage (or recording medium) which recorded the program code of the software which realizes the function of an embodiment mentioned above, It cannot be overemphasized that it is attained, also when a system or a device is supplied and the computer (or CPU and MPU) of the system or a device reads and executes the program code stored in the storage. In this case, the function of an embodiment which the program code itself read from the storage mentioned above will be realized, and the storage which memorized that program code will constitute this invention. By executing the program code which the computer read, Based on directions of the program code the function of an embodiment mentioned above is not only realized, but, It cannot be overemphasized that it is contained also when the function of an embodiment which performed a part or all of processing that the operating system (OS) etc. which are working on a computer are actual, and was mentioned above by the processing is realized.
[0049]After the program code read from the storage was written in the memory with which the function expansion unit connected to the expansion card inserted in the computer or the computer is equipped, It cannot be overemphasized that it is contained also when the function of an embodiment which performed a part or all of processing that CPU etc. with which the expansion card and function expansion unit are equipped are actual, based on directions of the program code, and was mentioned above by the processing is realized.
[0050]
[Effect of the Invention]The high-definition coding processing to high resolution images is attained without spoiling compatibility with the device only corresponding to a low resolution picture according to this invention, as explained above.

[Translation done.]